[001] MACHINE TOOL GEAR MECHANISM

[002]

[003]

[004] The present invention concerns a machine tool transmission, specifically a special spindle transmission according to the preamble of patent claim 1.

[005]

[006] The invention concerns a spindle transmission with which the strength and/or torque transfer from the output shaft of the transmission takes place directly on the spindle. The spindle is preferably placed in a co-axial arrangement with the output shaft. In the mentioned transmission, the output shaft is directly connected to the spindle. The torque proof connection, between the spindle and output shaft, can be carried out by positive fitting or by non-positive fitting. From this arises the necessity for a transferring device for cooling fluids, oils or air that flow between the transmission output and the spindle.

[007] The described invention tackles this problem based on a machine tool transmission, in particular a spindle transmission of the kind specified initially, on which the placement of a device for the transfer of cooling fluids, oils or air between the transmission shaft and the spindle is intended.

[008] The problem mentioned is solved by the features of patent claim 1. Further configurations and advantages can also arise from the patent sub claims.

[009]

[010] Accordingly, a spindle transmission is proposed with which the force and/or torque transfer is carried out directly from the transmission output shaft to the spindle into which a sealed rotary feed-through is integrated, which serves as the device for transferring the cooling fluids, oils or air between the transmission output and the spindle.

[011] This type of transmission normally includes a two stage planetary gear and a corresponding switching device, so that a rotational speed difference is

developed between the motor shaft and the transmission output. For this reason, according to the invention, a dynamic sealing regulator is envisioned for the admission of the volume quantities and resulting pressures.

[012] In the framework of a preferential execution form of the described invention, the sealed rotary feed-through is supported in the output shaft and includes two gaskets which serve as sealing regulators and as the admission device for the rotational speed difference. Depending on the medium, on the existing pressure and on the volumetric flow, the gaskets can be made of different materials and can have different geometries.

[013] In accordance with a favorable development of the invention, the sealed rotary feed-through includes a spring that compresses the gaskets together, leading to little or no leakage in the gaskets if the medium pressure increases. If there is no medium flow, gasket wear can be minimized by moving the two gaskets away from each other with the help of a device such as another spring, for example.

[014] According to the invention design, the sealing regulator is shifted outside of the transmission, resulting in the benefit that any allowed leaks can be led back directly into a tank. With a solution according to the state of the art, the sealing regulators must seal 100% since, otherwise, the transmission oil would be contaminated, for example with cooling fluid, leading to a malfunction of the transmission.

[015] The invention is exemplified in a more detailed basis in the attached Figure, which shows a schematic cutaway view of a preferential configuration of the transmission in accordance with the described invention. Planetary gears as they are usually installed in a machine tool transmission, in particular in a spindle transmission, are well known by those skilled in the art, for example as in the Applicant's EP 1 169 582 B1. The spindle transmission shown in the Figure includes a planetary gear, which is also applicable in further types of transmissions which are considered the state of the art.

[016]

[017]

[018]

[019]

[020] The Figure shows a spindle transmission 1, which includes a drive shaft 2, an output shaft 3 and a two stage planetary gear arranged in the force flow direction between the drive shaft and the output shaft. The planetary gear features a sun gear 4 connected with the transmission shaft 2, an internal gear 5 mounted in an internal gear housing 6 and a planetary pinion cage 7 with planetary gear 8, connected with the drive shaft 2, which form the output of the planetary gear.

[021] The switching unit of the transmission is formed by a solenoid 9, which actuates a shift fork 10 that can be relocated by an actuating shaft 11. The output shaft 3 is supported by bearings 13, 14 which are placed in a bearing housing 12 where it is connected with a spindle 15.

[022] In accordance with the invention, a sealed rotary feed-through is integrated into the transmission 1, which serves as the fluid transfer device for the flow of cooling fluids, oil or air between the transmission output 3 and the spindle 15.

[023] The sealed rotary feed-through is supported in the output shaft 3 and includes two gaskets 16, 17 which serve as sealing regulators and as the take up mechanism for the rotational speed difference. Gasket 16 is hereby intended to be the gasket on the engine side and gasket 17 is intended to be the spindle side gasket.

[024] According to the Figure, the engine side gasket 16 is connected by a tube 18, the sun gear 4 and a hub 19 with the engine shaft and/or drive shaft 2. The spindle side gasket 17 is directly placed in the spindle 15 or in an additional connecting part, for example in a clutch.

[025] The housing of the sealed rotary feed-through must preferably be supported by one or multiple bearings similar to a bearing 20, which can be ball bearings, roller bearings, friction bearings or hydraulic bearings. As can be seen in the Figure, the sealed rotary feed-through is formed by a check valve 21, which

prevents pipe 18 from running dry and the connection lines from being operated without pressure.

[026] In the context of the configuration represented in the Figure, the sealed rotary feed-through includes a spring 22, which presses the gaskets 16,17 together. In direct gear (1 to 1 ratio) there is no rotational speed difference present at the sealing regulator, however, the rotating gaskets 16, 17 must keep the same static sealing.

[027] Since the configuration of the sealing regulators, according to this invention, allows for leaks outside of the transmission, at least one leakage return flow 23 to a tank must be provided.

Reference numerals

1	transmission
2	drive shaft, motor shaft
3	output shaft
4	sun gear
5	internal gear
6	internal gear housing
7	planetary pinion cage
8	planetary gear
9	solenoids
10	shift forks
11	actuating shafts
12	bearing housing
13	bearing
14	bearing
15	spindles
16	engine side gasket
17	spindle side gasket
18	pipes
19	hubs
20	bearing
21	check valves
22	springs
23	leakage return flow